

## WHAT IS CLAIMED IS:

1. A control apparatus for an on-vehicle electricity storage device, which is installed in a vehicle having an internal combustion engine as a power source, a motor capable of electrical power generation, and an electricity storage device, the control apparatus comprising:

an electrical power consumption measuring device for measuring electrical power being consumed in the vehicle;

a charge control device for controlling the electricity storage device depending on the consumed electrical power measured by the electrical power consumption measuring device so that the electricity storage device is placed in and out of a charging mode in which electrical energy, which is converted from output power of the internal combustion engine or from a portion of a kinetic energy of the vehicle using the motor, is charged into the electricity storage device;

an inter-terminal voltage measuring device for measuring the inter-terminal voltage of the electricity storage device;

a voltage sustain time measuring device for measuring a sustain time which begins when the electricity storage device is placed out of the charging mode by the charge control device, and during which the inter-terminal voltage measured by the inter-terminal voltage measuring device remains equal to or greater than a predetermined value; and

a non-charge sustain time setting device for setting a non-charge sustain time, during which the electricity storage device is kept out of the charging mode, depending on the sustain time measured by the voltage sustain time measuring device.

2. A control apparatus for an on-vehicle electricity storage device according to claim 1, further comprising a charging mode executing device for placing the electricity storage device in the charging mode, regardless of the consumed electrical power measured by the electrical power consumption measuring device, when the time during which the electricity storage device has been placed out of the charging mode reaches the non-charge sustain time set by the non-charge sustain time setting device.
3. A control apparatus for an on-vehicle electricity storage device according to claim 1, wherein the non-charge sustain time setting device is adapted to set the non-charge sustain time to be zero when the sustain time measured by the voltage sustain time measuring device is less than a predetermined lower threshold sustain time, and to set the non-charge sustain time to be a predetermined upper limit sustain time when the sustain time measured by the voltage sustain time measuring device is greater than a predetermined upper threshold sustain time.
4. A control apparatus for an on-vehicle electricity storage device according to claim 1, further comprising a non-charge sustain time correction device for correcting the non-charge sustain time, which is set by the non-charge sustain time setting device, depending on the electrical power being consumed, which is measured by the electrical power consumption measuring device, during a sustain time which begins when the electricity storage device is placed out of the charging mode by the charge control device, and during which the inter-terminal voltage measured by the inter-terminal voltage measuring device remains equal to or greater than a predetermined value.
5. A control apparatus for an on-vehicle electricity storage device, which is installed in

a vehicle having an internal combustion engine and a motor capable of electrical power generation as power sources, a main electricity storage device for storing electrical energy which is converted from output power of the internal combustion engine or from a portion of a kinetic energy of the vehicle using the motor, and an auxiliary electricity storage device connected to the main electricity storage device, the control apparatus comprising:

an electrical power consumption measuring device for measuring electrical power being consumed in the vehicle;

a charge control device for controlling the auxiliary electricity storage device depending on the consumed electrical power measured by the electrical power consumption measuring device so that the auxiliary electricity storage device is placed in and out of a charging mode in which the electrical energy supplied from the motor or electrical energy supplied from the main electricity storage device is charged into the auxiliary electricity storage device;

an inter-terminal voltage measuring device for measuring the inter-terminal voltage of the electricity storage device;

a voltage sustain time measuring device for measuring a sustain time which begins when the electricity storage device is placed out of the charging mode by the charge control device, and during which the inter-terminal voltage measured by the inter-terminal voltage measuring device is maintained to be equal to or greater than a predetermined value; and

a non-charge sustain time setting device for setting a non-charge sustain time, during which the electricity storage device is kept out of the charging mode, depending on the sustain time measured by the voltage sustain time measuring device.

6. A control apparatus for an on-vehicle electricity storage device according to claim 5, further comprising a charging mode executing device for placing the electricity storage

device in the charging mode, regardless of the consumed electrical power measured by the electrical power consumption measuring device, when the time during which the electricity storage device has been placed out of the charging mode reaches the non-charge sustain time set by the non-charge sustain time setting device.

7. A control apparatus for an on-vehicle electricity storage device according to claim 5, wherein the non-charge sustain time setting device is adapted to set the non-charge sustain time to be zero when the sustain time measured by the voltage sustain time measuring device is less than a predetermined lower threshold sustain time, and to set the non-charge sustain time to be a predetermined upper limit sustain time when the sustain time measured by the voltage sustain time measuring device is greater than a predetermined upper threshold sustain time.

8. A control apparatus for an on-vehicle electricity storage device according to claim 5, further comprising a non-charge sustain time correction device for correcting the non-charge sustain time, which is set by the non-charge sustain time setting device, depending on the consumed electrical power measured by the electrical power consumption measuring device during a sustain time which begins when the electricity storage device is placed out of the charging mode by the charge control device, and during which the inter-terminal voltage measured by the inter-terminal voltage measuring device remains equal to or greater than a predetermined value.